

Collecting among the volcanoes of Eastern Java. (*With two plates.*)

By DR. E. A. COCKAYNE, F.E.S.

The volcanoes of Western and Central Java, with their wonderful cloak of virgin forest, have been described by many writers, notably by Wallace in his classical work, *The Malay Archipelago*, in which he gives an account of his ascent of the Gedeh and Pangerango. The drier volcanic mountains of the East end of the island have been far less frequently visited, and are comparatively little known except to the Dutch. It is true that both Wallace and Doherty visited the outlying Arjoeno, but neither appears to have collected on the main mass of the Tengger volcanoes. Their appearance and the character of their vegetation is so unlike anything I saw in Ceylon or Celebes, the only two other equatorial islands I visited, and their entomological wealth is obviously so great, that I think an account of my brief stay at Tosari in July, 1910, may interest others, and better still perhaps stimulate them to go out of their way to pay a longer and more profitable visit to the locality. I can assure them it would be made enjoyable by the ease and comfort of travel, and by the courtesy and ready help afforded by the Dutch, civilian or official.

Leaving the damp heat of Soerabaya at 8.12 in the morning, I travelled by train through the fertile coast plains with their rich crops of rice, tobacco, and sugar cane, to Pasaroean, where I arrived about 9.30. Here I hired a pony and cart and was driven to Pasrepan, along a broad road lined by grand avenues of tamarind, kanari, and teak trees. Amongst the many fine insects seen on this part of the journey were two *Attacus atlas*, on the underside of a huge banana leaf. They were the first I had seen at rest by day. After narrowly escaping disaster in a collision with a cart heavily laden with cut sugar-cane and drawn by two large bulls, I reached Pasrepan and changed into a smaller cart, in which the long ascent up the lower slopes of the Tengger Mountains was made as far as Poespo. This part of the road is bounded all the way by hedges of lantana, a flowering shrub always frequented by tropical butterflies. My slow ascent was enlivened by the sight of great numbers of *Precis iphita* var. *horsfieldi*, *P. erigone*, Cram., the intermediate form, *P. asterie*, crowds of representatives of the genus *Catopsilia*, and the abundant yellow *Terias libythea*, innumerable "blues," and the less frequent but more brilliant spectacle of a deep purple *Euploea*, probably *Salpinx leucostictus*, or a huge orange-tipped *Hebomoia glaucippe*. At Poespo the road becomes too steep for carts, and the rest of the journey, taking about 2½ hours, is performed on a small but hardy native pony. The vegetation during the ascent gradually changes in character as more and more temperate forms replace the tropical and appear amongst the exotic shrubs and graceful tree-ferns. Above Poespo the road at first runs through extensive coffee plantations growing in the shade of forest trees crowned with clusters of huge red blossoms and inhabited by numerous bands of monkeys.

In the shady parts hundreds of the dull brown Satyrid, *Sadarga nala* were noticed, and many of the beautiful Lycænid *Ilerda epicles*, whose wings are splashed with orange and purple, were fitting about the edges of the road. The swift low flight of *Catopsilia scylla*

gave one a glimpse of its white forewings and brilliant orange hindwings as it crossed and recrossed the sunnier spaces, and once I saw the flash of the metallic green spots on the hindwings of the gorgeous *Papilio arjuno* var. *tenggerensis*. Here, too, I caught *Hypselis vera* and both sexes of *Symbrethia confluens* var. *jaranus*. Both sexes of the former and the male of the latter closely resemble a brown *Neptis* as they rest on the extremity of a branch, but their flight is much swifter; the female *Symbrethia*, in Java, resembles the common black and white *Neptis leucothöe*, though elsewhere it is brown and black like the male.

Mounting higher and higher we left the coffee plantations behind and reached the steep bare slopes and deeply cut ravines of the Tengger Mountains. Their forests have all been cut down long ago and no trees have been left, except here and there a fine old tjemara (*Casuarina*) tree with graceful tamarisk-like foliage. Many young ones have been planted recently by the Dutch, but have not yet had time to alter the somewhat barren aspect of the hills. Every available piece of ground is cultivated, chiefly with Indian corn, the staple food of the natives, replacing rice, which, it is said, they vowed never to eat again after they were driven from the plains by the victorious Mohammedans. Cabbage and other homely vegetables are also grown in great quantities to supply the cities of the plain. In the late afternoon I arrived at the Sanatorium Tosari, a comfortable hotel, built on a small plateau in the style usual in this country, and lying nearly 6,000 feet above sea level. It consists of low pavilions, one containing the public rooms, the others the bedrooms, each opening independently on to a broad verandah. The drawing-room was upholstered in red velvet and made a quaint contrast with the bedrooms, which were furnished in a style suited to the tropics, but its brilliant lights were most attractive to moths at night, though, but for the rules of the hotel by which the lights were all turned out at 10.30, the number of interesting species taken would have been much larger.

On the morning after my arrival I left the hotel at 4 a.m. to see the active volcano. My journey up the steep slippery path, so steep in parts that it is cut in steps, mounted on a small pony and guided by a native torchbearer, was by no means lacking in excitement. We reached the edge of the crater at 6 a.m. and had breakfast. To the geologist this is a most interesting region. The summit of the mountain is formed by an enormous, almost perfect crater four or five miles in diameter. It is no longer active, and its floor is formed by sand and volcanic debris, the "sand sea." In the centre of this four small volcanic cones have been erupted at different times and form a complex group. The nearest, the Batok, is an almost perfect cone, and looks so bare and uniform that it appears to be artificial. The active volcano, the Bromo, lies behind, and is half hidden. It is always pouring out smoke, and the dull roar from its crater was clearly heard. All the trees on the steep sides of the main crater, here called the tjemara-lawang (gate of the spirits), are scorched, though they lie nearly two miles from the Bromo. When I reached this, the "sand sea" was full of white mist, above which peeped the Batok and the other craters. Beyond the far side was the sharp cone of the Semeroe volcano (12,000 feet high), which is also in constant eruption. As the sun rose, the mist gradually melted away, and huge clouds of white smoke

rolled out of the Bromo, whilst from the summit of the Semeroe puffs of deep orange-coloured smoke shot up every few minutes and gradually drifted away. I led my pony down into the "sand sea," and riding across to the Bromo, walked up the steep slope to the summit, which lies only 714 feet above the level of the "sand sea." This, however, is itself between 8,500 and 9,000 feet above sea level. The vegetation is very scanty, and consists chiefly of coarse grass; in fact, the sand is so sparsely covered that mirages are of frequent occurrence. The rough slopes of the wall of the main crater support a much richer vegetation. There are a good many tjemaras and mimosas, and there is a thick herbaceous undergrowth, from which I disturbed so many moths that I determined to visit it again next day on foot and armed with my net. I discovered that the time each day for collecting butterflies would be very short. For although almost every morning begins at sunrise with a cloudless sky, and the hills stand out sharp in the clear air, at about 10 o'clock clouds form on the sides of the mountains and gradually increase, spreading upwards and downwards, until the whole summit is enveloped in a vast mass of clouds which does not disperse till sunset. At first it is too cold for butterflies to fly, and, just as they are fully on the wing, the first wisps of damp cloud appear, and soon a fine drizzling rain begins, and lasts from about midday till late afternoon.

As I had decided, I left the hotel at 7.30 a.m. the next morning, and soon saw four species of Lycaenid, *Lampides boeticus*, *Catachrysops strabo*, Fabr., *Euchrysops cnejus*, Fabr., and a large form of *Zizera otis*, the first named being much the commonest. Climbing a little higher I met with dozens of *Pyrameis cardui*, rather small, but otherwise typical, and saw multitudes of their larvæ feeding on a species of *Artemisia*. At about 7,000 feet *Argynnis niphe* var. *javaensis* was seen, the males of which are much smaller and paler than those met with in Ceylon. The female, with its white apical band, closely resembles *Danaüs chrysippus*, of which it is generally accepted to be a mimic. But though I took the species on numerous occasions in Java and Ceylon, where I also saw hundreds of the Danaid, and was more than once deceived by mistaking the *Argynnis* for the Danaid, I never saw the two species in the same locality; the *Argynnis* prefers a different kind of country, and lives at a much greater elevation. In Japan, where the fritillary is met with, the *Danaüs* does not exist. The male *Argynnis* flies swiftly and low down over the grassy banks, the female is slower on the wing, but both love to rest with wings expanded on the path. On the whole I am inclined to regard this as one of those cases of accidental resemblance, of which many other wonderful examples could be collected. It is misleading, because the geographical range of the two species is closely similar. The white apical band is common to many groups of Nymphalines and is probably ancestral. These curious accidental resemblances must occur, owing to the strictly limited range of size of Lepidoptera and of possible colours and patterns, but it must not be thought that my remarks are intended to cast any doubt on the theories of mimicry, which are far too well founded to be shaken by the necessity of discarding one commonly quoted example.

Somewhat higher is a more level stretch covered with tjemara trees and with a carpet of pink flowered brambles, and it was in this part

that I first saw the big black and white Danaine butterfly *Mangalisa albata*. It was not common, and flew high in the air. Apparently it likes the bare open summit of the crater as much as the woodland, and on the Gedeh and Kawah Manoeck, further West, it flew in the thickest parts of the virgin forest. Resting on the plants under the tjemaras a large and handsome long-winged *Abraxas confluentaria*, Warr., was common, which Doherty took on the neighbouring volcano, the Arjoeno, while on their trunks was an occasional worn Boarmiid, and two specimens of a *Cidaria* were taken. Beyond this wood is the loveliest display of flowers which I saw in the tropics. There is a shallow valley with here and there a rough mass of volcanic rock. A few small tjemaras and mimosas break its monotony, but the whole valley is blue with the gigantic Bromo forget-me-not; here and there the large yellow blooms of a big St. John's wort afford a striking contrast. A tall green spurge is common, and a herbaceous plant six or eight feet high, with flowers stiff-petalled like the everlasting flower, brackens, and an occasional tree-fern, were seen. Other large and showy plants grew here, amongst them one with orange flowers, and a yellow-blossomed leguminous plant. Amongst the smaller plants I noticed a species of dead nettle, a buttercup (*Ranunculus*), a violet (*Viola*), a pale yellow *Calceolaria*, a beautiful blue-flowered leguminous plant with a clover-like leaf, a *Thalictrum*, and sorrel and dock (*Rumex*). In spite of all the flowers, butterflies were very scarce, and I only saw one additional species, the pale blue *Cyaniris akasa*, much the shape of *C. argiolus*, but with black tips to the forewing in both sexes. Many were drinking at the damp patches on the path. Further on a stream crossed the path, and along its course grew clumps of giant nettle ten feet high, and near them *Pyrameis dejeani* was abundant. The species is like *P. atalanta* in markings, but the white and red are replaced by a dark cream, and the black by dark brown. It flies swiftly, but does not travel far, and often settles on the path with wings spread in the sunshine, and when it rains a good many can be found at rest on the upper side of the nettle leaves. The larva was quite common, living singly in a closed-up leaf, and though I failed to find a pupa, I shook out an imago whose wings had not yet begun to expand. The larva is much like the darker form of *P. atalanta*. Wherever the banks were steep and covered with long grass and rough herbage, Geometers were abundant, especially near the crater wall. The vast majority proved to be the very variable *Xanthorrhoe ludifica*, Warr., and one *Dysstroma citrata (immanata)* was caught, and a conspicuous moth with shining deep brown forewings and pale straw-coloured hindwings, with a sharp cut black border, *Photoscotia multiplicata*, Warr., was common, and easily disturbed. Here, too, I caught a fine brown and white *Deilemera*, a species unrepresented in the British Museum, and a small semitransparent Syntomid, a species also hitherto undiscovered and since named *Callitomis phaeosoma*, Hmps. Later I took two more near the hotel. It is much like *Callitomis dohertyi*, first discovered by Doherty on the Arjoeno, but the abdomen is black instead of yellow. The group is common in Java and I found another new species, *C. multincta*, Hmps., with white spots on the forewings and a yellow ringed abdomen, on the summit of the Kawah Manoeck volcano near some pools of boiling mud. The other days I was there I caught scarcely any more species, but every night at the

lamps in the hotel I made many additions to my captures. Night work; in this locality would undoubtedly repay the entomologist. The paths are in many places protected by posts and wires, and sugaring would be an easy matter, but I think a sheet and lamp would bring in a richer harvest. Even in the hotel moths swarmed, and, like the vegetation, they gave one strange contrasts for temperate and tropical genera and species. Amongst the commonest were *Agrotis* (*Arylia*) *putris* and *Cirphis* (*Leucanea*) *extranea* (= *unipuncta*), whilst a species *C. albicosta* near *C. albipuncta* was equally abundant, and the ever present *Sphinx convolvuli* was common.

Amongst other species the following were taken, for the identification of which I am greatly indebted to Sir George Hampson and Mr. Prout, but many still remain unnamed.

RHOPALOCERA:—NYMPHALINÆ: *Pyrameis dejeani*: *Argynnis niphæ*. EUPLEINÆ: *Manylisa albata*, Zinck-Sommer. ACRÆINÆ: *Telesimia resta*. LYCÆNIDÆ: *Lycaenopsis* (*Cyaniris*) *akasa*: *Lampides boeticus*, Lin.; *Catachrysope strabo*, Fabr.; *Euchrysope cnejus*, Fabr.; *Zizeva otis*, Fabr.

HETEROCERA:—SPHINGIDÆ: *Sphinx convolvuli*. NOLIDÆ: *Celama phoeochroa*, Hmps. n.; *Celama mesomelana*, Hmps. n. SYNTOMIDÆ: *Callitomis phaeosoma*, Hmps. n. LITHOSIDÆ: *Asura calanaria*, Moore; *Miltochrista euprepia*, Hmps. n.; *Miltochrista scripta*, Walk. NOCTUIDÆ: *Clarida assulba*; *Agrotis conspurcata*; *Agrotis puta*; *Agrotis* (?) *dahlî*; *Polia pamosa*, Moore, subsp. *sikkima*; *Cirphis albicosta*; *Cirphis extranea* (*unipuncta*); *Eriopsis chloridia*, Green; *Conseivula r-brunnea*, Green; *Acrapex prisca*, Walk.; *Acrapex* (?) *brunnea*, Hmps. n.; *Acrapex leucophaebia*; *Sesamia inferens*; *Xylostola indistincta*, Moore; *Amyra glaucopora*, Hmps. n.; *Borotia* (?) *stellata*; *Borotia* (?) *renalba*; *Sinna calospila*, Walk.; *Plusia orichalcea*, Fabr.; *Plusia confusa*, Moore; *Ericeta inangulata*. SARROTHRIPIDÆ: *Sarrothripus grisea*, Hmps. n.; *Blenina quinaria*, Moore; *Risoba prominens*, Moore; *R. viridescens*, Hmps. n. (n.sp.). SATURNIIDÆ: *Loepa katinka*, Westw. (a large male). EUPTEROTIDÆ: *Eupterote testacea*, Walk. LIMACODIDÆ: a species not in the British Museum. LASIOCAMPIDÆ: a species not in the British Museum. HYPSIDÆ: *Argina argus*, Koll.; *Deilemera* sp. (?). LYMANTRIDÆ: *Euproctis oreosaura*, Swinh.; *Euproctis*, n.sp.

GEOMETRIDÆ:—Amongst others were the following:—HEMITHEINÆ: n.gen., n.sp.; *Diplodisma abrupta*, Swinh.; *Timandra punctinervis*, Prout, n.sp.; *Erythrolophus bipunctatus*, Warr. (or n.sp. allied to it); *Ptychopoda* two (?), (n.sp.); *P. delicatula*, Warr. (subsp. of *holosericeata*); *Sauris* (?), n.sp.; *Photoscotosia multiplicata*, Warr.; *Dysstroma citrata*, L., var. *cuneifera*, Warr.; *Xanthorrhoe ludifica*, Warr.; *X. sordidata*, Moore.; *Zividara palpata*, Walk.; *Eupithecia eupitheciata*, Guen.; *Eupithecia*, n.sp. (?); *Nadagara* (?), two n.sp.; *Lucivaria contigaria*, Walk. (common); *Lucivaria* (?), n.sp.; *Tephriopsis parallelaria*; *Tephriopsis* (?), n.sp.; *Boarmia acaciaria*, Boisd.; *Boarmia* (?), sp.; *Urapteryx pluristrigata*, Warr.

### In Andalusia—March and April, 1913.

By ROSA E. PAGE, B.A.

Mr. Page and I little thought, on quitting Spain last August, that within a year we should be returning thither; but the opportunity